

PATENT SPECIFICATION

1,023,433

DRAWINGS ATTACHED.

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Int. Cl.:—G 01 d //G 01 l.

COMPLETE SPECIFICATION.

Improvements in or relating to Indicating Instruments.

We, S. SMITH & SONS (ENGLAND) LIMITED, a British Company of Cricklewood Works, Cricklewood, London, N.W.2, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to indicating instruments of the kind in which the magnitude of a measured quantity is indicated by a pointer in conjunction with a scale inscribed around a dial.

According to this invention we provide an indicating instrument of the kind referred to comprising a case having a base, an externally threaded cylindrical wall projecting from the base so as to enclose a space and at least one abutment projecting inwardly from the wall on which the dial rests, and a window having inner and outer ridges projecting from it around its periphery so as to define an annular groove, the outer ridge being internally threaded, the window being screwed onto the wall so that the wall is located in the annular groove and the inner ridge being shaped to come into contact with the dial so as to hold the dial in position against the projecting abutment or abutments.

Preferably a finger projects from the wall and fits into a corresponding slot in the dial, whereby the dial is located in a desired angular position.

Preferably the inner ridge has a plurality of projections which come into contact with the dial and hold it in position against the projecting abutment or abutments.

Preferably the window and the case are moulded from thermoplastic material and when the window has been screwed onto the

wall, the window and the wall are heated so that they are welded together.

A pressure gauge in accordance with this invention will now be described with reference to the accompanying drawings of which:—

Figure 1 is a front view partly in section, of the pressure gauge omitting the dial, pointer and window.

Figure 2 is a section taken along the line II—II shown in Figure 1.

Figure 3 is a section taken along the line III—III shown in Figure 1.

Figure 4 is a view of a detail shown in Figure 1.

Figure 5 is a view of a detail shown in Figure 2.

Figure 6 is a view of another detail shown in Figure 2.

Figure 7 is a view of a further detail shown in Figure 2.

Figure 8 is a view of a quadrant which may be incorporated in the gauge shown in Figure 1 to make it suitable for use with pressures lower than atmospheric pressure i.e. as a vacuum gauge.

Referring to Figure 1 one end of a Bourdon tube 1 is fitted into and brazed to a brass anchor plate 3 (also shown in Figure 4). The anchor plate 3 has a cavity 70 into which the Bourdon tube 1 fits and a curved extended limb 69 which is fitted into a correspondingly shaped slot 4 in the case (generally indicated at 5) of the pressure gauge. The anchor plate 3 is provided with serrations 80 which retain it within slot 4. The case 5 is moulded from a suitable plastic material which may contain a reinforcing medium and is formed with a base 21 and a cylindrical wall 47. An end cap 75 is fixed to the other end of the Bourdon tube 1,

[Price 4s. 6d.]

which is free to move when the fluid within the Bourdon tube 1 is at a pressure different from that of the pressure outside the Bourdon tube 1. A copper capillary link tube 5 7 is fitted into an orifice 8 drilled through the anchor plate 3, leads into a bore 14 drilled through a brass shank 9 and is soldered to the shank 9 within the bore 14 (indicated at 10). The shank 9 has a cylindrical portion 39 which has external annular grooves 40, a portion 62 of hexagonal cross-section, a cylindrical portion 63, a further portion 11 of hexagonal cross-section, an externally threaded cylindrical portion 13 and a cylindrical portion 15 of reduced diameter. The case 5 is moulded onto the portions 39, 62 and 63 and the annular grooves 40 and the hexagonal portion 62 serve to hold the case 5 onto the shank 9. The shank 9 may be screwed into a mating member which has a threaded member which corresponds with the threaded portion 13. The bore 14 is internally threaded at the external end of the shank 9 so that a suitably threaded member which restricts the flow of fluid to the Bourdon tube 1, may be screwed into the bore 14. A fluid whose pressure is to be measured is introduced into the Bourdon tube 1 through the bore 14, the tube 7 and the anchor plate 3.

One end of a bent rod 16 is attached to the cap 75 and its other end fits into a slot 17 in a quadrant 18 which is rotatably pivoted about a pin 19. The pin 19 is fixed between the base 21 and a movement plate 20 held parallel to the base 21 by pillars 22 projecting from the plate 20 which fit into sockets 23 projecting from the base 21 (a pillar 22 and a socket 23 are shown in Figure 2). The quadrant 18 has an arm 2 which carries a ring 24 which is also fitted about the pin 19 (Figures 2 and 3) so that the quadrant 18 is pivoted about the pin 19 at two bearing points. A yoke 25 (shown in section in Figure 6) has one end shaped in the form of a semi-circle and fitted about the pin 19 between the quadrant 18 and the ring 24 and has at its other end a threaded part which is fitted about an adjusting screw 26 which is rotatably mounted in bearings 28 and 29 (Figure 3) in the plate 20 and the base 21 respectively. The threaded part consists of three semi-circular rings 30, 31 and 32, two rings 30 and 31 being disposed on one side and one ring 32 being disposed on the other side of the screw 26. The threads of the rings 30, 31 and 32 form a continuous thread which corresponds to the thread of the screw 26, and is an interference fit on it. The three rings 30, 31 and 32 ensure that the plane of the yoke 25 (indicated at 34 in Figure 3) is at 90° to the axis of the screw 26 (indicated at 36). The head 37 of the screw 26 rests in the bearing 29 and has a hexagonal recess

(indicated at 27) into which the head of suitably shaped screw driver may be fitted. A spring washer 45 is disposed between the base 21 and a circular plate 46 projecting from the screw 26. The spring 45 and the interference fit of the thread on the rings 30, 31 and 32, together prevent the screw 26 rotating when the pressure gauge is moved or vibrated but permit deliberate rotation of the screw 26 using a screw driver.

The quadrant 18 has a toothed section 43 centred on the pin 19, which engages with the teeth of a long pinion 41 which carries a pointer 42. A hairspring 71 is attached to the pinion 41 by a collet 72 and to the plate 20 and provides a small torque on the pinion 41 when it is rotated away from its datum position. The hairspring 71 thus eliminates any backlash in the system. The teeth of sector 43 and the pinion 41 are helical in form so that if the quadrant 18 is displaced relative to the pinion 41 in a direction parallel to the axis of the pin 19 and the pinion 41, the pinion 41 rotates together with the pointer 42 while the pressure of fluid inside the Bourdon tube 1 remains constant. The end of the pointer 42 is disposed adjacent to a scale inscribed around a dial 44. The dial 44 rests in three shoulders 48, 49 and 50 which project from the wall 47 and are equally spaced around it. The dial 44 is located in position by a small slot 51 at its periphery which fits over a finger 52 projecting from the shoulder 48.

A circular window 53 (shown in Figure 2 and 5) has two annular rings 54 and 55 projecting from it around its periphery and is held on to an annular ring 56 projecting from the wall 47 by a thread 64 formed internally on the ring 54 which is screwed on to a mating thread in the ring 56. The window 53 is locked in position on the wall 47 by heating it and the wall 47 so that the materials of the window 53 and wall 47 bond together. Three small pips 58, 59 and 60 project from the ring 54 and press against the dial 44 holding it in position against the shoulders 48, 49 and 50, and thus the window 53 serves to hold the dial 44 in place. The part of the window 53 adjacent to the finger 52 is cut away (indicated at 57). The window 53 is provided with radial serrations 77 at its periphery so that it may easily be screwed on to the wall 47. The window 53 is made from a transparent plastic material, which may be an acetate or a propionate. The threads 63 and 64 act as a seal preventing dust from entering the pressure gauge.

Ten holes 61 (four of the holes are indicated in Figure 1), are cut in the base 21 and are covered by a circular disc 65 which is moulded from a resilient plastic material such as poly-vinyl chloride. The disc 65 is

held against the base 21 by an annular ring 66 projecting from the rim of the disc 65 which is fitted into a circular groove 67 in the base 21. The disc 65 with the ring 66 is fitted within the groove 67 serves as a seal and prevents the entry of dust. The contour of the section of the ring 66, shown in Figure 7 has a circular portion. When the pressure inside the case exceeds that outside the case, the pressure acts on the part of the disc 65 covering the holes 61 so that the disc 65 distorts pivoting about the ring 66. When the difference in pressure is great enough the ring 66 is forced out of the groove 67 and the disc 65 is blown away from the base 21, thus connecting the space within the pressure gauge to the outside atmosphere. It is arranged that the difference between the pressure within the case 5 and that outside the case 5 required to blow the disc 65 away from the case 5 is less than that required to force the window 53 away from the case. The disc 65 thus serves as a safety valve and prevents the window 53 from being forced away from the case 5. The pressure within the case 5 will only exceed that outside the case if there is a leakage of fluid from the Bourdon tube 1.

In use when a fluid under pressure is forced into the Bourdon tube 1, the Bourdon tube 1 tends to straighten so that the rod 16 is moved, rotating the quadrant 18 in the anticlockwise direction and the pinion 41, with the pointer 42, in the clockwise direction.

A suitably threaded member may, as previously explained, be screwed into the bore 14 and may be shaped to reduce fluctuations in the pressure in the fluid passing through the bore 14. Such fluctuations may occur if the pressure gauge is employed to measure the pressure of a fluid passing through a positive displacement pump.

To adjust the position of the end of the pointer 42 when there is no fluid under pressure connected to the gauge or when fluid at a known pressure is connected to the gauge, the screw 26 is rotated displacing the yoke 25 and the quadrant 18 in a parallel to axis of the pin 19 and the pinion 41 and as the quadrant 18 is displaced the pinion 41 and the pointer 42 rotate. The screw 26 is rotated until the pointer 42 is aligned with a mark on the scale representing zero pressure or the known pressure.

The previously described pressure gauge may be used to indicate pressure below the atmospheric pressure by replacing the quadrant 18 by the alternative form of quadrant 6 (shown in Figure 8). A sector of teeth 38 is cut on the internal face of a cut-out (so that the pinion 41 engages the sector 38 internally). In use, when a fluid at a pressure below that of the atmospheric pressure is connected to the gauge, the radius of

curvature of the Bourdon tube is reduced so that the rod 16 is moved rotating the quadrant 6, the pinion 41 and the pointer 42 in the clockwise direction.

The complete specifications of Applications Nos. 2969/63 (Serial No. 1,023,432), 2971/63 (Serial No. 1,023,434) and 2972/63 (Serial No. 1,023,435) contain a description of the pressure gauge described in this specification.

WHAT WE CLAIM IS:—

(1) An indicating instrument of the kind referred to comprising a case having a base, an externally threaded cylindrical wall projecting from the base so as to enclose a space and at least one abutment projecting inwardly from the wall on which the dial rests, and a window having integral inner and outer ridges projecting from it around its periphery so as to define an annular groove, the outer ridge being internally threaded, the window being screwed onto the wall so that the wall is located in the annular groove, and the inner ridge being shaped to come into contact with the dial so as to hold the dial in position against the projecting abutment or abutments.

(2) An indicating instrument as claimed in claim 1 wherein a finger projects from the wall and fits into a corresponding slot in the dial, whereby the dial is located in a desired angular position.

(3) An indicating instrument as claimed in claim 1 or claim 2 wherein the inner ridge has a plurality of projections which come into contact with the dial and hold it in position against the projecting abutment or abutments.

(4) An indicating instrument as claimed in any preceding claim wherein there are three abutments projecting inwardly from the wall.

(5) An indicating instrument as claimed in any preceding claim wherein the window and the case are moulded from thermoplastic material and when window has been screwed onto the wall, the window and the wall are heated so that they are welded together.

(6) An indicating instrument as claimed in any preceding claim and arranged to indicate the magnitude of a fluid pressure, which comprises a disc of resilient material and having a projecting ridge with a closed contour, the base having an orifice surrounded by a groove, and the ridge being fitted into the groove, the size and shape of the groove being such that the disc must be slightly distorted in order to fit the ridge into the groove, so that if the difference between the pressure inside the case and that outside the case exceeds a predetermined level, the ridge is forced out of the groove and the disc is forced away from the case

thereby connecting the space inside the case to the space outside the case.

- 5 (7) An indicating instrument as claimed in claim 6 wherein the disc is circular and the ridge comprises a ring projecting from the periphery of the disc.

- (8) An indicating instrument as claimed

in claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

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For the Applicants,
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COMPLETE SPECIFICATION

3 SHEETS

This drawing is a reproduction of
the Original on a reduced scale
Sheet 1

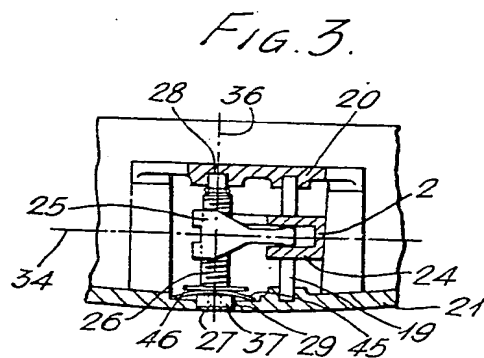
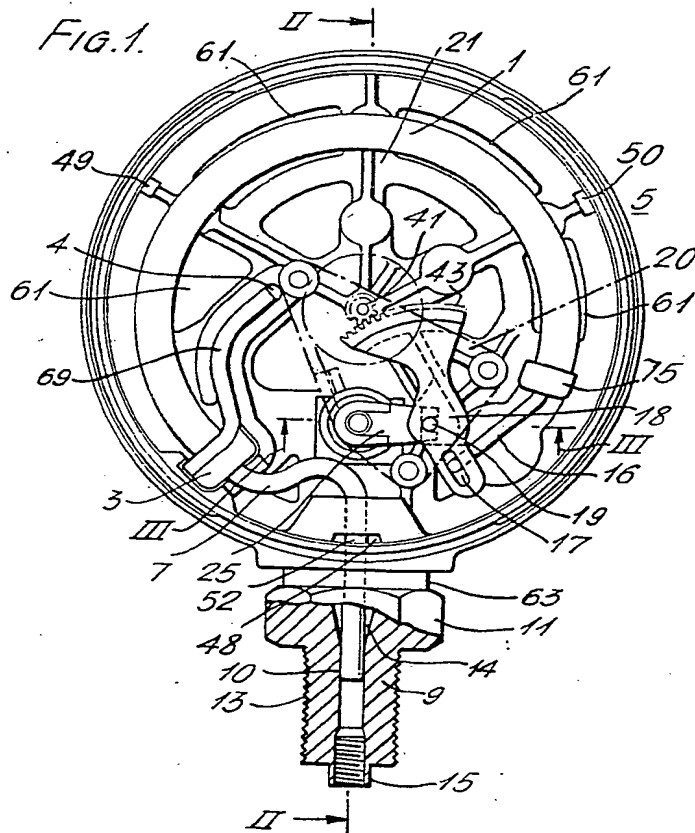


FIG. 2.

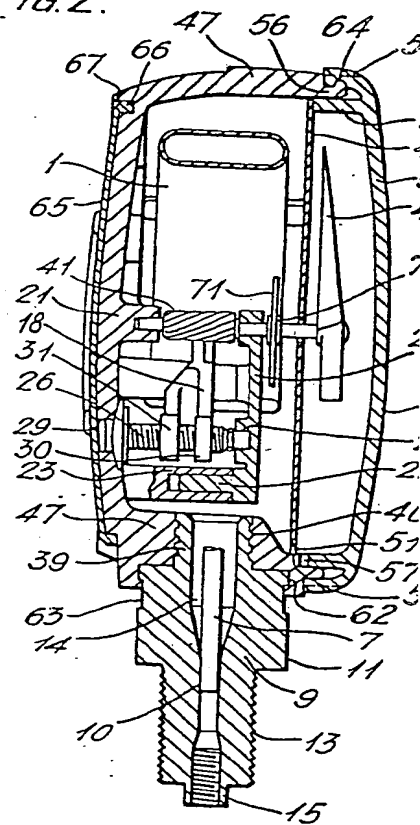
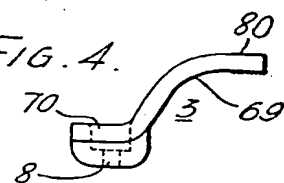


FIG. 4.



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COMPLETE SPECIFICATION

3 SHEETS

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the Original on a reduced scale
Sheets 2 & 3

